Presenting characteristics, length of stay and oxygen use among COVID-19 cases at a single tertiary hospital in Auckland, New Zealand, using retrospective medical recorded data

Nicole Hotchkiss, Georgia Van Zantvoort, Christin Coomarasamy, Eunicia Tan, Andrew Brainard

ABSTRACT

AIMS: The purpose of our current study was to analyse demographic and presenting characteristics of COVID-19 patients, including assigning clinical severity scores, and analyse with respect to oxygen utilisation and hospital course.

METHODS: This was a retrospective observational study of COVID-positive patients presenting to the Emergency Department at Middlemore Hospital in Auckland, New Zealand. Data were collected between 1 August 2021 and 1 November 2021. They were followed through 20 December 2021. Data were obtained from both the EMR system and paper charts for all eligible patients during the study period.

RESULTS: There were 171 patients included, with 187 patient presentations. Oxygen data were collected on 123 admitted patients and showed that 47% of admission time was spent off oxygen. Of the total presentations, the median length of stay (LOS) was 4 days. The severity of presenting illness was associated with disposition and predictive of LOS.

CONCLUSIONS: Approximately half of the admitted patient's hospital time involved no oxygen use, which suggests that we may be able to further risk stratify in order to decrease the number and duration of hospital admissions going forward. As expected, clinical severity scores were associated with oxygen utilisation, disposition and LOS.

New Zealand has experienced coronavirus disease 2019 (COVID-19) differently than the rest of the world. Initially, a successful COVID-19 elimination strategy of managed isolation at the border, nationwide lockdowns and contact tracing resulted in very few cases.[1] In August 2021, a single community case of Delta COVID-19 was reported, and eventually led to endemic spread. Due to the earlier success of the elimination strategy early in the pandemic, there have been limited data specific to COVID-19 patients in New Zealand.

In the August 2021 Delta outbreak, the use of diagnostic and predictive models for COVID-19 for clinical and resource management were undeveloped. Efficient diagnosis and clinical predictors of disease severity were needed. In North America, a systematic review of 232 prediction models found two promising models.[2] The Risk Stratification in the Emergency Department in Acutely Ill Older Patients (RISE UP) score and 4C mortality score could be used to guide decision making.[3,4] Oxygen has been the mainstay of treatment for COVID-19, and being able to predict oxygen utilisation could enable more efficient allocation of resources. Noh et al. discovered risk factors for receiving oxygen therapy in early stage COVID-19.[5] Prediction models to help with resource utilisation may become increasingly important.

The purpose of our current study is to gather and analyse demographic and presenting characteristics of our unique population in New Zealand that occurred during the Delta outbreak, including clinical severity scores, oxygen utilisation and hospital course.

Methods

Design, setting and participants

We conducted a retrospective observational cohort study of COVID-19 patients aged ≥15 years presenting to the Emergency Department (ED) at Middlemore Hospital, Auckland, New Zealand. The Middlemore Hospital ED is one of the busiest EDs in Australasia, serving a population of approximately 525,000 people, with over 100,000 annual presentations. Patients were included into the cohort if they presented to the ED with

a positive COVID-19 nasopharyngeal polymerase chain reaction (PCR) test from the community or during their hospital journey. Patients who presented multiple times were included as separate presentations. Positive COVID-19 cases that were detected in the community or managed isolation and quarantine (MIQ) but did not present to the ED, interhospital transfers, and paediatric patients (aged ≤14 years) were excluded.

Data collection

Data were obtained from the electronic medical record (EMR) system, paper charts and EpiSurve (disease surveillance database tracking New Zealand COVID-19 cases). Data on demographics, presenting characteristics, initial presenting complaints, disposition and patient journey timeline characteristics were collected. Oxygen use was collected from inpatient EMR (eVitals). Data were managed using REDCap.[6]

Clinical severity scores

Patients were assigned clinical severity scores using the National COVID-19 Clinical Evidence Taskforce Living Guidelines and Consensus Recommendations,[7] and the World Health Organization (WHO) severity score.[8] Two study investigators (NH and GVZ) scored after retrospectively reviewing the ED chart. (See supplementary material.)

Oxygen use

We collected oxygen use data on oxygen flow rate, fractional inspiration of oxygen (FiO_2) and oxygen device from the EMR. Due to inconsistencies in the data collection of oxygen flow rate and FiO_2, only the oxygen device was used for analysis. The oxygen device was treated as an ordinal variable and included nasal prongs, high flow nasal prongs, air blender, non-invasive ventilation (NIV) (including both continuous positive airway pressure (CPAP) and bilevel positive airway pressure (BIPAP)) and invasive mechanical ventilation. Total number of hours during which each inpatient was on an oxygen device was measured and then divided by the patient's total inpatient length of stay (LOS). Analysis was done on the proportion of the patient's stay that was spent on each oxygen device, including no oxygen device. ED and intensive care unit (ICU) data were not analysed due to inconsistent collection in the EMR, but for analysis purposes ICU time was considered equivalent to intensive oxygen use.

Data analysis

We summarised data as counts and proportions for categorical variables, and mean with standard deviation (SD) or median with interquartile range (IQR) for continuous variables as appropriate. Ethnicity was prioritised as per the New Zealand Ministry of Health ethnicity data protocols.[9] The oxygen usage was calculated as cumulative sum of total oxygen use divided by the total usage. This was reported as a percentage based on the total use. To determine differences in the discharge and admission rates across severity, Chi-squared or Fisher exact test were used. Analysis of variance (ANOVA) or Kruskal–Wallis test were used to determine if LOS varied across severity. Association between shift time, speciality and LOS will be looked at using ANOVA. A two-tailed $p<0.05$ was considered statistically significant. Data were analysed using R and SAS version 9.4.

Results

Cohort description

Between 1 August 2021 and 1 November 2021, there were a total of 171 COVID-19 patients (male n=84, 49% and female n=87, 51%) and 187 presentations. We followed patients through 20 December 2021. The mean age was 40.6 (SD 18.8) years. Most patients were Pasifika (n=89, 52%) or Māori (n=59, 35%). The majority (n=140, 82%) of patients were unvaccinated (Table 1).

Presenting characteristics

Most (n=116, 62%) were self-presentations, while 29% (n=55) were referred from the MIQ facility (Table 1). Most (n=146, 78%) had a moderate Australasian Triage Scale (ATS) category of 3, with only 17 (9.1%) in the critical (ATS=1) or severe (ATS=2) categories. Most (n=128, 69%) arrived by ambulance and presented with a commonly described COVID-19 viral symptom (e.g., cough, fever, shortness of breath) (n=129, 69%) (Table 1).

Clinical severity

In terms of clinical severity scores, the majority of patients presented with mild (n=43, 23%), moderate (n=68, 36%) or severe (n=39, 21%) disease. The WHO score showed the majority of patients had mild (n=72, 39%) or moderate (n=112, 60%) disease (Table 2).

Oxygen use

Oxygen use data were collected on admitted

Table 1: Demographic and presenting characteristics of patients with COVID-19.

Age: mean (Std)	**40.6 (18.8)**	
	n	%
Gender		
Female	87	51
Male	84	49
Ethnicity		
Pasifika	89	52
Māori	59	35
New Zealand European	13	7.6
Asian	9	5,3
Other	1	0.6
Referred to hospital by		
Self-presentation	116	62
MIQ referral	55	29
GP/Accident & Medical	11	5.9
Other	5	2.7
Australasian Triage Score		
1	1	0.5
2	16	8.6
3	146	78
4	21	11.2
5	3	1.6
Mode of arrival to hospital		
Ambulance	128	69
Other	3	1.6
Walk-in	56	30
Vaccination status at ED arrival		
Fully immunised (2 dose + 2 weeks)	4	2.3
Partially vaccinated (1 dose)	27	16
No vaccine	140	82

Table 1 (continued): Demographic and presenting characteristics of patients with COVID-19.

Age: mean (Std)	**40.6 (18.8)**	
	n	%
Initial speciality caring for patient		
Emergency medicine	126	67
General medicine	48	26
General surgery	7	3.7
Respiratory medicine	4	2.1
Other	2	1.1
Initial presenting complaint (SNOMED)	**n**	**%**
Likely COVID-19 presenting complaint	**129**	**69**
Shortness of breath	70	37
Cough	20	11
Fever symptoms	19	10
Chest pain	9	4.8
General weakness/fatigue/being unwell	4	2.1
Sore throat	4	2.1
Abnormal vital signs	1	0.5
Coughing up blood	1	0.5
Exposure to communicable disease	1	0.5
Possible COVID-19 presenting complaint	**31**	**17**
Abdominal pain	15	8.0
Collapse/syncope	6	3.2
Headache	5	2.7
Dizziness/vertigo	2	1.1
Nausea/vomiting	2	1.1
Seizure	1	0.5
Unlikely COVID-19 presenting complaint	**27**	**14**
Injury of back, or upper/lower limb	6	3.2
Back or lower limb pain (no injury)	5	2.7
Suicidal thoughts or self-harm	4	2.2

Table 1 (continued): Demographic and presenting characteristics of patients with COVID-19.

Initial presenting complaint (SNOMED)	n	%
Unlikely COVID-19 presenting complaint	**27**	**14**
Localised lump/redness/swelling of skin	2	1.1
Rectal bleeding	2	1.1
UTI symptoms	2	1.1
Mental health issue or situational crisis	2	1.0
Certificate or paperwork requested	1	0.5
Disorder of pregnancy	1	0.5
Vaginal bleeding (not pregnant)	1	0.5
Weakness of facial muscles	1	0.5

Abbreviations: COVID-19 = coronavirus disease 2019; GP = general practitioner; MIQ = managed isolation and quarantine

patients. Of these 123 admitted patients, 47% of their admitted hospital time was completely off oxygen. Percentage of admitted time on oxygen increased with severity of illness, except in those classified as critical (n=3, 2.4%), where 87% of their time was spent off oxygen. This prolonged "off oxygen" time for the critical patients was due to their long rehabilitation time. The severity of the presenting illness was associated with which oxygen device was used, with increased severity associated with increasingly invasive devices (Table 2).

Clinical outcomes and disposition

Out of the total 187 patient presentations, 123 were admitted. Most patient presentations were initially seen in the ED by emergency medicine (n=126, 67%) and were grouped into the moderate, severe or critical category of presenting illness (n=110, 59%). Those grouped into the minimal/no, mild category (n=77, 41%) were most often discharged (n=51, 66%). Across initial treating speciality, we found that patients were most likely admitted to the ward, but emergency medicine was the most likely to discharge patients (n=59, 47%) (Table 3).

Of all presentations, the median LOS stay was 3.98 days. The WHO score was predictive of LOS, with cases classified as severe having a median of 12.83 days. There was one in-hospital death, but no additional fatalities at 60-day follow-up. The WHO score was also associated with a decreased time spent in the ED, with those categorised as severe having a median ED LOS 2.17 hours. Those patients being discharged to MIQ spent the longest time in the ED (median 9.14 hours). (Table 4).

Discussion

This study is the first of its kind to present hospital oxygen utilisation, clinical outcome and demographic data from the beginning of New Zealand's COVID-19 Delta outbreak. The utility of analysing ED-based COVID-19 data is demonstrated by the COVID-19 Emergency Department (COVED 0–5) Quality Improvement Project based in Australia, which also showed information on demographics and clinical predictors of COVID-19 disease.[10–14]

One of the unique aspects of our study is the socio-economically disadvantaged South Auckland population consisting mainly of Pasifika and Māori patients. Other research shows that minority groups had higher rates of COVID-19 disease and severity than non-minorities, and that socio-economic disparity and clinical care quality were associated with COVID-19 outcomes

Table 2: Presenting severity of illness by intensity of oxygen use on ward for the 123 admitted patients with COVID-19.

		Proportion of inpatient time on oxygen device									
		No vs any oxygen device (%)		No to minimal oxygen vs moderate to intensive oxygen (%)		Specific device (%)					
	n (%)	No O_2	Any O_2	None+nasal cannula	Mask+HFNO+NIV+ICU	Nasal cannula	Air blender	Mask	HFNO	NIV	ICU
All	123 (100%)	47%	53%	66%	34%	20%	0.80%		14%	14%	4.10%
Presenting severity of illness (pts)											
Minimal/No	10 (8.1%)	75%	25%	100%		25%					
Mild	16 (13%)	96%	4%	97%	3.30%	0.80%			1.80%	1.50%	
Moderate	55 (45%)	51%	49%	72%	28%	21%			11%	17%	
Severe	39 (32%)	17%	83%	44%	56%	27%	2.10%	0.53%	24%	19%	10%
Critical	3 (2.4%)	87%	13%	87%	13%			5.20%	6.90%		0.70%
Grouped by presenting severity of illness categories											
Minimal/no, mild	77 (41)	94%	6%	97%	3%	3%			2%	1%	
Moderate, severe, critical	110 (59)	35%	65%	58%	42%	24%	1%		17%	18%	5%
Grouped by presenting WHO clinical severity scores											
Mild (1–3)	72 (39)	35%	65%	65%	35%	30%			2%	33%	
Moderate (4–5)	112 (60)	48%	52%	66%	34%	18%	1%		16%	11%	5%
Severe (6–9)	3 (2)	56%	44%	71%	29%	15%			11%	15%	3%

Abbreviations: Pts = patients; O2 = oxygen; HFNO = high flow nasal oxygen; non-invasive ventilation; ICU = intensive care unit.

Table 3: Disposition and representation number and rate grouped by presenting clinical severity and initial speciality for patients with COVID-19.

	Total patients (n/%)				**Discharged (n/%)**				**ED admit to hospital (n/%)**		
Disposition	**Total**	**Total ED discharge**	**Total admits**	**P-value**	**Discharge: to home**	**Discharge: to MIQ**	**Self-discharge**	**Represent to hospital after discharge**	**Admit: ward**	**Transfer**	**Admit: ICU/HDU**
All	187	64 (34)	123 (66)		30 (16)	30 (16)	4 (2)	34 (18)	120 (64)	1 (0.5)	2 (1)
Presenting severity of illness category											
Minimal/no	34 (18)	24 (71)	10 (29)	<0.0001	12 (35)	8 (24)	4 (12)	15 (44)	9 (26)	1 (3)	0
Mild	43 (23)	27 (63)	16 (37)		10 (23)	17 (40)	0	3 (7)	16 (37)	0	0
Moderate	68 (36)	13 (19)	55 (81)		8 (12)	5 (7)	0	13 (19)	55 (81)	0	0
Severe	39 (21)	0	39 (100)		0	0	0	3 (8)	38 (97)	0	1 (3)
Critical	3 (2)	0	3 (100)		0	0	0	0	2 (67)	0	1 (33)
Grouped by presenting severity of illness categories											
Minimal/no, mild	77 (41)	51 (66)	26 (34)	<0.0001	22 (29)	25 (32)	4 (5)	18 (23)	25 (32)	1 (1.3)	0
Moderate, severe, critical	110 (59)	13 (12)	97 (88)		8 (7)	5 (5)	0	16 (15)	95 (86)	0	2 (2)
Grouped by presenting WHO clinical severity scores											
Mild (1–3)	72 (39)	60 (83)	12 (17)	<0.0001*	28 (39)	28 (39)	4 (6)	18 (25)	12 (17)	0	0

Table 3 (continued): Disposition and representation number and rate grouped by presenting clinical severity and initial speciality for patients with COVID-19.

	Total patients (n/%)				**Discharged (n/%)**				**ED admit to hospital (n/%)**		
Disposition	**Total**	**Total ED discharge**	**Total admits**	**P-value**	**Discharge: to home**	**Discharge: to MIQ**	**Self-discharge**	**Represent to hospital after discharge**	**Admit: ward**	**Transfer**	**Admit: ICU/HDU**
Grouped by presenting WHO clinical severity scores											
Moderate (4–5)	72 (39)	4 (4)	108 (96)		2 (2)	2 (2)	0	16 (14)	107 (96)	1 (1)	0
Severe (6–9)	3 (2)	0	3 (100)		0	0	0	0 (0)	1 (33)	0	2 (67)
Initial speciality treating patient											
Emergency medicine	126 (67)	59 (47)	67 (53)	<0.0001*	28 (22)	28 (22)	3 (2)	21 (17)	64 (51)	1 (1)	2 (2)
General medicine	48 (26)	2 (4)	46 (96)		1 (2)	1 (2)	0	11 (23)	46 (96)	0	0
General surgery	7 (4)	1 (14)	6 (86)		0	1 (14)	0	2 (29)	6 (86)	0	0
Other	2 (1)	2 (100)	0		1 (50)	0	1 (50)	0 (0)	0	0	0
Respiratory medicine	4 (2)	0	4 (100)		0	0	0	0 (0)	4 (100)	0	0

Fisher exact test used; Abbreviatons: MIQ = managed isolation quarantine facility; ICU = intensive care unit, HDU = high dependency unit.

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Table 4: ED and hospital length of stay (LOS) of patients with COVID-19.

	Total length of hospital stay in days Median (IQR)	P-value	Total ED time in hours Median (IQR)	P-value	Total Ward+ICU time (non-ED hospital time) in days Median (IQR)	P-value
All/total patients	3.98 (2.02–7.81)		5 (3.57–7.60)		3.73 (1.69–7.72)	
Presenting severity of illness category						
Minimal/no	1.10 (0.69–1.96)	<.0001	4.39 (3.13–7.95)	0.0025	0.92 (0.38–1.58)	<0.0001
Mild	3.35 (2.00–5.45)		6.80 (4.72–9.53)		3.03 (1.8–5.37)	
Moderate	3.54 (1.89–60)		5.44 (4.04–7.27)		3.34 (1.66–5.78)	
Severe	6.87 (4.05–15.01)		3.97 (3.03–5.67)		7.68 (4.07–14.87)	
Critical	9.39 (4.72–12.83)		4.13 (4.03–10.17)		9.22 (4.3–20.41)	
Grouped by presenting severity of illness category						
Minimal/no, mild	2.1 (1.12–3.95)	0.001	5.8 (3.57–9.18)	0.05	1.80 (0.94–3.38)	0.0003
Moderate, severe, critical	4.45 (2.52–8.06)		4.67 (3.57–6.68)		4.43 (2.33–8.74)	
Grouped by presenting severity of illness category (WHO Scores)						
Mild (1–3)	1.83 (0.69–3.15)	0.0005	5.69 (3.67–9.25)	0.0198	1.44 (0.52–2.90)	0.0001
Moderate (4–5)	4.05 (2.12–7.91)		4.83 (3.55–6.75)		3.99 (1.95–7.76)	
Severe (6–9)	12.8 (7.81–60.9)		2.17 (1.00–4.13)		20.41 (10.4–99.8)	
Initial speciality treating patient						
Emergency medicine	3.95 (2.07–6.79)	0.0915	5.59 (3.63–8.85)	0.014	3.7 (1.67–6.74)	0.071
General medicine	5.04 (2.12–9.06)		4.32 (3.48–5.75)		4.91 (1.98–9.29)	
Other	2.37 (1.39–4.65)		5.88 (4.03–6.97)		2.11 (1.12–4.14)	
Disposition						
Admitted to ward	3.97 (2.04–7.11)	0.0263	4.83 (3.51–6.75)	<.0001	3.72 (1.7–7.69)	0.020
Discharged home	0.29 (0.29–0.29)		4.77 (3.63–7.05)			
Discharged to MIQ	N/A		9.14 (4.92–14.17)			
Other	36.85 (12.8–60.9)		3.43 (0.95–4.13)		60.1 (20.4–99.8)	

in minority groups.15 Our research did not find any significant differences in admission versus discharge, oxygen utilisation or LOS by ethnicity. This is likely due to the small sample size for comparison.

Even though most patients had mild or moderate disease, they often arrived by ambulance. During New Zealand's first lockdown in early 2020, Dicker et al. also found that a large proportion of low-acuity patients requested ambulance services, but many were not unwell enough to require transport.[1]6 This ambulance utilisation may be due to the public being fearful of leaving home to seek medical treatment independently, or reduced access to primary care during lockdown. Although telemedicine was available during lockdown, virtual consultations may also have been a barrier to access for both patients and providers.

Clinicians also had a risk-averse practice pattern. There was a 71% admission rate, with 34% of the admitted patients having minimal/no or mild severity. This is higher than the 67% admission rate reported in the COVED-5 study.[14] Furthermore, 47% of the admitted patients' time was spent off oxygen. While this may be due to minimal clinical experience with a novel virus, it is likely also due to unclear admission and discharge criteria. Updated clinical management guidelines have likely decreased admission rates compared to early in the pandemic.[17] Sze et al. found there is large variability amongst discharge criteria for COVID-19 patients.[18] Development of evidence-based discharge guidance for hospitalised COVID-19 patients could be helpful as the pandemic continues.

In addition to unclear discharge criteria, another potential contributor to our admission rate was the arduous process involved in safely discharging patients into isolation facilities with an elimination strategy in place. Our study showed that the total ED time for patients requiring an MIQ facility for isolation was significantly longer than other dispositions. This may have led to a tendency for admitting patients, as it was less cumbersome with less delay in patient flow from an ED clinician standpoint. Now that New Zealand has moved away from an elimination strategy, the issues associated with the MIQ discharge no longer have the detrimental impact that occurred early in the pandemic.

During the first wave in 2020, Australian hospitals had a median ED stay of 4.7 hours and a hospital stay of 9.8 days.[19] Our findings were consistent in terms of ED LOS, however, our hospital LOS was shorter with a median of 4 days. This is likely due to admitting a large number of minimally and mildly severe cases. Development of a prediction tool, such as the DELTA risk score, can be considered to minimise unnecessary utilisation of healthcare resources.[20]

Limitations

The main limitation of our study is the retrospective design, with the potential for inaccurate or incomplete data. This was apparent with our oxygen data, where there were missing data and discrepancies between oxygen device, FiO_2 and flow rate. Additionally, we had a relatively small sample size, as all of our cases were from early in the Delta surge during an elimination strategy, before widespread vaccination and without the current treatment options.

Conclusion

For the first 187 ED presentations during the COVID-19 Delta outbreak, approximately half of the admitted patients' hospital time involved no oxygen use. The initial presenting clinical severity was associated with oxygen utilisation, disposition and length of stay.

COMPETING INTERESTS
Nil.

AUTHOR INFORMATION
Nicole Hotchkiss, DO, FACEP: Emergency Medicine Consultant, Emergency Department, Middlemore Hospital, Te Whatu Ora – Counties Manukau District, Auckland, New Zealand.
Georgia Van Zantvoort, BNurs: Registered Nurse, Emergency Department, Middlemore Hospital, Te Whatu Ora – Counties Manukau District, Auckland, New Zealand.
Christin Coomarasamy: Biostatistician, Research and Evaluation Office, Middlemore Hospital, Te Whatu Ora – Counties Manukau District, Auckland, New Zealand.
Andrew Brainard, MD, MPH, FACEM, FACEP: Co-Director of Emergency Medicine Research, Emergency Department, Middlemore Hospital, Te Whatu Ora – Counties Manukau District, Auckland, New Zealand; Senior Lecturer in Emergency Medicine, Department of Surgery, Faculty of Medical and Health Sciences, The University of Auckland, Auckland, New Zealand.
Eunicia Tan, MB ChB, FACEM: Co-Director of Emergency Medicine Research, Emergency Department, Middlemore Hospital, Te Whatu Ora – Counties Manukau District, Auckland, New Zealand; Senior Lecturer in Emergency Medicine, Department of Surgery, Faculty of Medical and Health Sciences, The University of Auckland, Auckland, New Zealand.

CORRESPONDING AUTHOR
Nicole Hotchkiss, DO, FACEP: Emergency Medicine Consultant, Emergency Department, Middlemore Hospital, Te Whatu Ora – Counties Manukau District, Auckland, New Zealand. E: nhotchkiss@gmail.com

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Appendices

Appendix 1: National COVID-19 Clinical Evidence Taskforce. Australian guidelines for the clinical care of people with COVID-19. 2022 [version 57]. Available from: https://covid19evidence.net.au/.

Presenting severity of illness definitions	
Minimal/no symptoms	**Adults without any symptoms in hospital for a non-COVID reason.***
Mild illness	Adults not presenting any clinical features suggestive of moderate or severe disease or a complicated course of illness. Characteristics: • No symptoms* • Or no mild upper respiratory tract symptoms • Or no cough, new myalgia or asthenia without new shortness of breath or a reduction in oxygen saturation
Moderate illness	Stable adult patient presenting with respiratory and/or systemic symptoms or signs. Able to maintain oxygen saturation above 92% (or above 90% for patients with chronic lung disease) with up to 4L/min oxygen via nasal prongs. Characteristics: • Prostration, severe asthenia, fever >38℃ or persistent cough • Clinical or radiological signs of lung involvement • No clinical or laboratory indicators of clinical severity or respiratory impairment
Severe illness	Characteristics (adult patients meeting any of the following criteria): • Respiratory rate ≥30 breaths/min • Oxygen saturation ≤92% at a rest state • Arterial partial pressure of oxygen (PaO2)/ inspired oxygen fraction (FiO2) ≤300
Critical illness	Characteristics (adult patient meeting any of the following criteria): • Respiratory failure • Occurrence of severe respiratory failure (PaO2/FiO2 <200), respiratory distress or acute respiratory distress syndrome (ARDS). • This includes patients deteriorating despite advanced forms of respiratory support (non-invasive ventilation (NIV), high-flow nasal oxygen • (HFNO)) OR patients requiring mechanical ventilation OR other signs of significant deterioration: • Hypotension or shock • Impairment of consciousness • Other organ failure.

*Patients without COVID-19 symptoms were classified as having minimal/no symptoms, which is altered from the National COVID-19 Taskforce Australian guidelines.

Appendix 2, Figure 1: WHO Working Group on the Clinical Characterisation and Management of COVID-19 infection. A minimal common outcome measure set for COVID-19 clinical research. Lancet Infect Dis. 2020 Aug;20(8):e192-e197.WHO clinical progression scale.

Patient state	Descriptor	Score
Uninfected	Uninfected; no viral RNA detected	0
Ambulatory mild disease	Asymptomatic; viral RNA detected	1
	Symptomatic; independent	2
	Symptomatic; assistance needed	3
Hospitalised moderate disease	Hospitalised; no oxygen therapy*	4
	Hospitalised; oxygen by mask or nasal prongs	5
Hospitalised severe disease	Hospitalised; oxygen by NIV or high flow	6
	Intubation and mechanical ventilation, pO_2/FIO_2 ≥150 or SpO_2/FIO_2 ≥200	7
	Mechanical ventilation pO_2/FIO_2<150 (SpO_2/FIO_2<200) or vasopressors	8
	Mechanical ventilation pO_2/FIO_2<150 and vasopressors, dialysis, or ECMO	9
Dead	Dead	10

Abbreviations: ECMO = extracorporeal membrance oxygenation; FIO_2 = fraction of inspired oxygen; NIV = non-invasive ventilation; pO_2 =partial pressure of oxygen; SpO_2 = oxygen saturation.
*If hospitalised for isolation only, record status as for ambulatory patient.